Computation of Safe Axial Pullout Capacity of Pile

By Static Analysis

Analysis in accordance with IS 2911 (Part 1 / Section 2) : 2010

Bishram ganj chandina market (TUDA)

Pile Type : **Bored Cast in Situ** **RCC Pile**

Loading : Axial Pullout (Uplift)

The safe uplift capacity of pile is calculated as :

$$Q_{safe}=(1/FS)\{\Sigma_{1\ to\ n}[(\alpha c+pk\tan\delta)A_s L]\} + W$$

where

Q_{safe}	=	Safe axial pile capacity, kN	FS	=	Factor of safety
α	=	Adhesion factor (*function of* C_u)	p	=	Overburden pressure, kN/m^2
δ	=	Friction angle between soil and pile, degrees (= ϕ)	L	=	Pile segment length in selected layer
c	=	Cohesion intercept, kN/m^2	k	=	Coefficient of earth pressure
γ'	=	Effective density of soil, kN/m^3	D	=	Pile diameter
n	=	Number of layers	A_s	=	Pile surface area per m length
W	=	Weight of the pile			

Pile cross section shape : circle

Pile cut-off Level (COL) : 2.0 m

Pile Diameter ,D : **400** **mm**

Pile Surface Area, A_s = 1.257 m^2/m length

Overburden Pressure to be considered below : COL

Consider overburden press. to become constant below : 20 pile diameters, i.e. 8.0 m below 2.0 m

i.e. 10.0 m below 0.0 m

Design Water Table Depth : 1.2 m

Factor of Safety : 3.0 *as per IS 2911 (Part1 / Section 2) : 2010 Clause 6.3.2*

Percentage of Ultimate Shaft Resistance to be used for Ultimate Pullout Capacity: 0.7

Layer No.	Depth,m From	Depth,m To	Soil Classification	c, kN/m^2	$\delta(=\phi)$, degrees	γ, kN/m^3	k	α
1	0.0	2.5	silty clay	0	7	18.7	1.0	1.00
2	2.5	5.0	silty clay	0	8	19.0	1.0	
3	5.0	7.5	silty clay	0	9	19.5	1.0	
4	7.5	10.5	silty clay	0	11	19.5	1.0	1.00
5	10.5	13.5	siltysand	0	28	20.0	1.0	
6	13.5	18.0	Sand	0	30	20.0	1.0	

Pile Capacity Calculation at following	14.0	16.0	18.0		

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Pile Length(s) below cut-off Level (m)					

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Pile Dia = 400 mm Bored Cast in Situ RCC Pile

Depth Below GL , m	Pile Length below COL,m	Layer No.	Soil Parameters			Overburden Pressure	Unit Skin Friction	Skin Friction in Layer	Cumulative Skin Friction	Weight of Pile	UltimatePullout Capacity	Safe Pullout Capacity	Safe Pullout Capacity
			c, kN/m^2	ϕ (=δ), degrees	γ_{eff}, kN/m^3	kN/m^2	kN/m^2	kN	kN	kN	kN	kN	MT
0.0	-												
		1	0.4	7									
1.2	-												
		1	0.4	7									
2.0	**0.0**					0.0							
		1	0.4	7	8.70	2.2	0.7	0	0				
2.5	**0.5**					4.4							
		2	0.0	8	9.00	15.6	2.2	7	7				
5.0	**3.0**					26.9							
		3	0.0	9	9.50	38.7	6.1	19	27				
7.5	**5.5**					50.6							
		4	0.4	11	9.50	62.5	12.5	39	66				
10.0	**8.0**					74.4							
		4	0.4	11	9.50	74.4	14.9	9	75				
10.5	**8.5**					74.4							
		5	0.0	28	10.00	74.4	39.5	149	224				
13.5	**11.5**					74.4							
		6	0.0	30	10.00	74.4	42.9	135	359	25	276	**108**	**11**
16.0	**14.0**					74.4							
		6	0.0	30	10.00	74.4	42.9	108	467	28	355	**137**	**14**
18.0	**16.0**					74.4							

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			c, kN/m^2	ϕ (=δ), degrees	γ_{eff}, kN/m^3	kN/m^2	kN/m^2	kN	kN	kN	kN	kN	MT